

PATENT  
Docket No.: ACT-377

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Group Art Unit: 2811

Examiner: Steven Ho Yin Loke

Serial No.: 10/625,490

Filed: July 22, 2003

In re Application of: Issaq et al.

For: SWITCHING RATIO AND ON-STATE RESISTANCE OF AN ANTIFUSE  
PROGRAMMED BELOW 5 mA AND HAVING A Ta OR TaN BARRIER  
METAL LAYER

---

**AMENDMENT**

Mail Stop Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

In response to the Office Action dated May 1, 2006, kindly amend the above-identified application as follows.

In the claims:

1-10. (Cancelled)

11. (Original) A metal-to-metal antifuse disposed between two metal interconnect layers in an integrated circuit comprising:

a tungsten plug disposed in a via in an insulating layer disposed above and in electrical contact with a lower metal interconnect layer;

a first layer of a barrier metal disposed above and in electrical contact with said tungsten plug forming a first electrode, said first layer of said barrier metal comprising a material selected from a group consisting of at least one of tantalum and tantalum nitride;

an antifuse layer disposed above an upper surface of said tungsten plug, said antifuse layer comprising a lower adhesion-promoting layer, a middle layer comprising amorphous carbon, and an upper adhesion-promoting layer;

a second layer of a barrier metal disposed over said antifuse layer forming a second electrode, said second layer of said barrier metal comprising a material selected from a group consisting of at least one of tantalum and tantalum nitride; and

a second insulating layer disposed over said first insulating layer, said antifuse layer, said first layer of said barrier metal, and said second layer of said barrier metal.

12. (Original) The metal-to-metal antifuse of Claim 11, wherein said layer of amorphous carbon is doped with at least one of hydrogen, fluorine, and hydrogen and fluorine.

13. (Original) The metal-to-metal antifuse of Claim 11, further comprising a spacer disposed in physical contact with said antifuse layer, said first layer of said barrier metal, and said second layer of said barrier metal.

14. (Original) The metal-to-metal antifuse of Claim 11, wherein said antifuse layer is about 10 nm to about 80 nm in thickness.

15. (Original) The metal-to-metal antifuse of Claim 11, wherein said first layer of said barrier metal layer and said second layer of said barrier metal layer are about 25 nm to about 200 nm in thickness.

16. (Previously Presented) The metal-to-metal antifuse of Claim 11, wherein said lower adhesion-promoting layer comprises amorphous silicon carbide, said middle layer comprises amorphous carbon, and said upper adhesion-promoting layer comprises amorphous silicon carbide.

17. (Previously Presented) The metal-to-metal antifuse of Claim 11, wherein said lower adhesion-promoting layer comprises amorphous silicon nitride, said middle layer comprises amorphous carbon, and said upper adhesion-promoting layer comprises amorphous silicon nitride.

18. (Original) The metal-to-metal antifuse of Claim 11, further comprising an oxide layer disposed on said second layer of said barrier metal layer.

19. (Original) The metal-to-metal antifuse of Claim 11, further comprising a tungsten layer disposed on said second layer of said barrier metal layer.

20-52.(Cancelled)

REMARKS

In the Office Action dated May 1, 2006, the Examiner required an election between Species 1-8. Election is to the species (5) illustrated in FIG. 3A. Claims 11 through 19 read on this species. This election is made without traverse.

Applicants reserve the right to prosecute the claims of the non-elected Species in Divisional Applications.

If the Examiner has any questions regarding this application or this response, the Examiner is requested to telephone the undersigned at 775-586-9500.

Respectfully submitted,  
SIERRA PATENT GROUP, LTD.

Dated: October 31, 2006

/kenneth d'alessandro/

Kenneth D'Alessandro  
Reg. No.: 29,144

Sierra Patent Group, Ltd.  
1657 Hwy 395, Suite 202  
Minden, NV 89423  
(775) 586-9500